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FOREST RESOURCES OF THE DELTA SECTION OF MISSISSIPPI

By

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A Progress Report by

THE SOUTHERN FOREST SURVEY

I. F. Eldredge, Regional Survey Director

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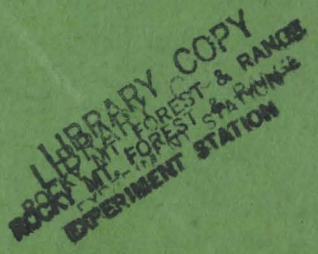

SOUTHERN FOREST EXPERIMENT STATION

E. L. Demmon, Director

New Orleans, La.

FOREWORD

The Forest Survey, which is a function of the United States Forest Service, was authorized by the McSweeney-McNary Forest Research Act of 1928 to make a nation-wide study of our forest resources. Its fivefold object is: (1) To make an inventory of the present supply of timber and other forest products, (2) to ascertain the rate at which this supply is being increased through growth, (3) to determine the rate at which this supply is being diminished through industrial and local use, windfall, fire, and disease, (4) to determine the present requirement and the probable future trend in the requirement for timber and other forest products, and (5) to correlate these findings with existing and anticipated economic conditions, in order that policies may be formulated for the effective use of lands suitable for forest production. Item 4 is being studied on a national basis and is not discussed in this report.

This release is based on a field survey made chiefly between April and August 1932, and on three field canvasses of forest industrial plants to determine forest drain, the last of which was made in cooperation with the Census and completed during June 1939. This release should be regarded only as a progress report, since it contains Forest Survey data that will be included in complete reports to be published later and that, although considered reliable, are subject to correction or amplification as the work of computation proceeds.

In the interpretation of these data, it should be noted that, owing to the sampling method used in collecting them, the greater the number of samples in any given classification the more accurate are the data for that classification. Classes that are of infrequent occurrence and relatively small in quantity generally were not determined with as high a degree of accuracy as classes that occurred more frequently and in substantially greater quantities. Small tabular items are to be taken, therefore, as showing not the exact magnitude of the classes involved, but their relative magnitude in comparison with those of other classes.

In the South, the Forest Survey is an activity of the Southern Forest Experiment Station with headquarters at New Orleans, La.

Assisting Staff*

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*The inventory field work in the Middissippi Delta Unit was organized and begun by G. H. Lentz, who, prior to March 15, 1932, was Acting Regional Survey Director.

Note: Assistance in the preparation of these materials was furnished by the personnel of Work Projects Administration official project 65-2-64-74.

FOREST RESOURCES OF THE DELTA SECTION OF MISSISSIPPI[1/]

Location and General Description

The Delta Region of the State of Mississippi (Forest Survey Unit No. 1) is a portion of the Mississippi River alluvial plain, roughly elliptical in shape, located between Vicksburg, Mississippi, and Memphis, Tennessee. Lying between the river and the bluffs forming the edge of the highland to the east, it includes all of ten counties and parts of nine others, as shown in figure 1, and has a land area of 4,411,100 acres. Although the Mississippi River was undoubtedly the major factor in its origin, the Delta unit is now drained almost entirely by the Yazoo River and its tributaries, which also drain a large portion of the neighboring upland.

Originally covered with hardwood forest, the alluvial soils of the Delta are in general very productive when protected from floods and properly drained. At the time of this survey (1932) approximately 57 percent of the area was in cropland or improved pasture. From early settlement, cotton has been the chief money crop in agriculture, and its culture has dominated the economy and development of the region. In recent years there has been a trend towards diversification, but cotton is still the dominant money crop. Cotton produced in the Delta is of excellent quality, and the region has the largest production of long-staple cotton in the United States. The city of Greenwood is recognized as the world's largest market of long-staple cotton.

Occupying 40 percent of the total land area, the forests of the Delta section contribute importantly in giving Mississippi fifth rank in the United States as a producer of hardwood lumber. A considerable local industrial development depends upon these forests for raw material for the manufacture of veneer, cooperage, wallboard, lumber and other products. They also provide a large volume of wood for fuel and farm use.

The population of the Delta in 1930, according to the Census, was about 465,000 persons, of whom 340,000 or 73 percent, were negroes. Agriculture at that time accounted for more than 80 percent of the workers gainfully employed. The census of 1940 gives the population as 480,000 with the gain entirely in the urban section. The rural population suffered a small reduction. Greenville, Greenwood, and Clarksdale are the principal towns with populations in 1940 of from 10- to 20-thousand persons each. Three Federal Aid highways run in a north-south direction through the region, and state and county highways are numerous except in the extreme southern part. Rail transportation is by the Yazoo and Mississippi Valley Railroad, a part of the Illinois Central System, and by the Columbus and Greenville which crosses the area from east to west near its middle. On the Mississippi River, Greenville and nearby Vicksburg and Memphis are important shipping and receiving points, and all- or part-season navigation is feasible on the Yazoo River and on

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1/ An earlier report on the Mississippi Delta (Forest Survey Release No. 6, Preliminary report on the forest survey of the bottomland hardwood unit in Mississippi. November 30, 1934--out of print) was based on a somewhat different system of classification than was used for the rest of Southern territory; for the present report, the original data were reworked to conform to the Survey's present system of classification.

portions of the Sunflower, Tallahatchie, Coldwater, and Yalobusha Rivers. Between New Orleans and points north of Memphis, regular barge service is maintained by several lines.

Land Use

The alluvial soils of the Delta are in general characterized by high natural fertility, but fully two thirds are heavy clays which without proper drainage are not well suited to farming. At the time of the original field survey (1932), 57 percent of the land area in the Delta region was given over to agriculture, 40 percent was in forest compared to 58 percent for the lower South, and 3 percent was occupied by towns, villages, roads, railroads, etc., as shown in table 1. The highest proportion of land in agriculture was in Sunflower, Coahoma, Bolivar, and Leflore counties; the lowest proportion in Issaquena and Sharkey counties and the Delta portion of Warren county. In the years that have elapsed since the survey field work, changes have undoubtedly occurred in individual counties in the areas in the different classifications, due both to land clearing and to cropland abandonment. For the region as a whole, however, the area available for crops has changed remarkably little according to the Agricultural Census figures for 1929, 1934, and 1939. In the 10 years from 1929 to 1939 the number of farms was reduced in all except 3 of the 19 counties and these 3 were included in those in which only a portion of their area is in the Delta. This reduction in number is reflected in the fact that the average area per farm increased from 37 to 50 acres, or about 37 percent in the same period.

Table 1.—Land area classified according to major land uses, 1932

Land use	Total land area[1/]	
	Acres	Percent
Forest	1,743,900	39.5
Agricultural:		
In cultivation:		
Old cropland	2,217,300	50.3
New cropland	126,600	2.9
Out of cultivation:		
Idle	75,500	1.7
Abandoned	46,500	1.1
Improved pasture	58,000	1.3
Total agriculture	2,523,900	57.3
Other:		
Nonmeandered waterways, towns, villages, roads, railroads, etc.	143,300	3.2
Total area	4,411,100	100.0

1/ Does not include Pittman Island, 9,262 acres.

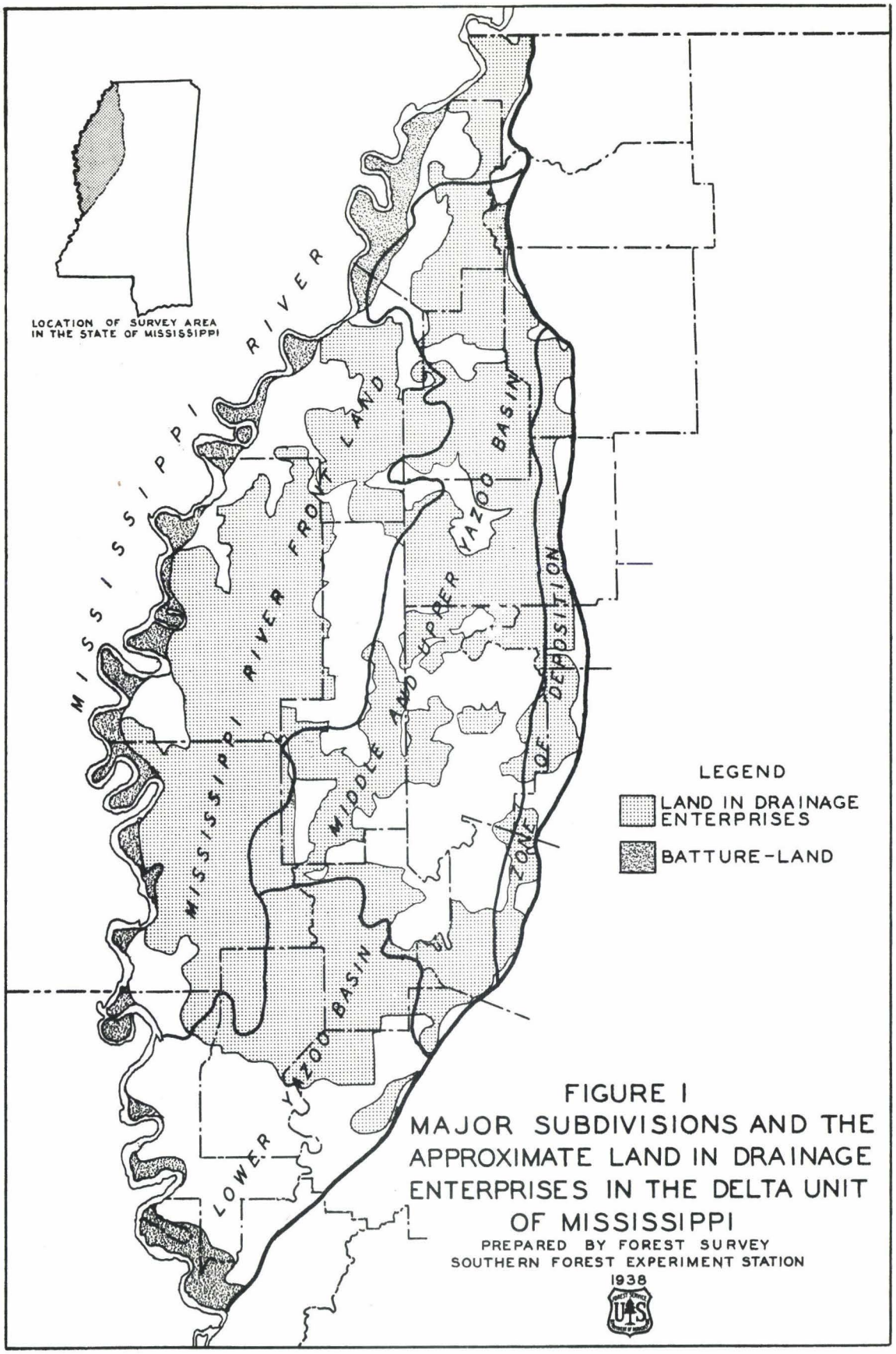


FIGURE I
MAJOR SUBDIVISIONS AND THE APPROXIMATE LAND IN DRAINAGE ENTERPRISES IN THE DELTA UNIT OF MISSISSIPPI

PREPARED BY FOREST SURVEY
SOUTHERN FOREST EXPERIMENT STATION
1938

The topography of the Delta region is that of a very gently undulating, alluvial plain, modified by the present courses and former beds of extremely sinuous, slow-moving streams. The higher lands are natural levees fronting present or former stream-courses. The interstream areas are lower and form poorly drained swales, except as modified by artificial drainage. In 1930 approximately half of the area was in organized drainage districts (fig. 1). Of the land in drainage enterprises, 30 percent was woodland.

On a basis of broad differences in drainage conditions, the Delta region is characterized by four natural subareas (fig. 1): (1) an extensive natural "front land" area bordering the Mississippi River, where the land is relatively high and better drained; (2) the middle and upper basin (in the Delta) of the meandering Yazoo River and its tributaries, where the land is lower lying; (3) the lower Yazoo basin, where backwaters from the Mississippi and Yazoo Rivers periodically inundate a large area for extended periods; and (4) a narrow zone below the bluffs, extending from central Panola County to southern Holmes County, where the bottomland soils have been buried beneath coarser material washed from the neighboring upland. Early agricultural development was confined to the Mississippi River front-land area, where natural drainage was most favorable and the damaging effect of annual floods least, and to the higher areas in the Yazoo basin, again, fronting on the major streams. With the building of artificial levees, beginning about 1850, and with the institution of artificial drainage, more extensive development of the Delta section began.

At present a high proportion of the Mississippi River front-land area is in cultivation, except between the main levees and the bank of the river (the batture), where only a negligible area is devoted to crops. In the middle and upper Yazoo basin the land is lower lying except along the river banks drainage costs are usually higher, the crop hazard is greater, and a slightly lower proportion of the land area is in cultivation. In the lower Yazoo basin, an extensive area above Vicksburg is thinly populated and little developed because of flood hazard and the drainage problem. A National Forest Purchase Unit now embraces much of this backwater area. The major problem, flooding, originates primarily from high levels on the Mississippi River, and until the larger problem of flood control on the main river is met, the area will probably remain thinly populated and little developed. In the fourth zone, deposition has elevated the area and reduced the flood menace, but, except for a narrow strip immediately adjacent to the loessal bluffs, the coarser upland materials that have been deposited are less fertile than the underlying heavier soils.

To control stream flow and erosion in a portion of the tributary uplands, and to reduce the drainage and flood problem in the upper and middle Yazoo basin, a project embracing the highland portion of the Tallahatchie River watershed has been initiated by the U. S. Department of Agriculture; the Soil Conservation Service, Bureau of Agricultural Economics, and Forest Service cooperate in the work. A primary aid in flood control is the dam near Sardis, recently completed by the Corps of Engineers, U. S. Army.

Land taxes in the Delta are generally high. In addition to State, local, and levee taxes, the half of the area that is in drainage districts must pay additional taxes for drainage improvements. Except on the Mississippi River batture and in the lower Yazoo backwater area, even State and local taxes on forest land are commonly high relative to the income-producing capacity of the soil. In the case of forest land in drainage districts, drainage taxes constitute a distinct, and often unbearable

burden without compensating benefits, and act as a serious obstacle to the practice of forestry. Most drainage districts have been enabled to reduce tax rates through refinancing, but as far as forest land is concerned, the reductions have not been adequate. In both the upper and lower portions of the Yazoo basin, considerable areas in drainage districts have reverted to the State for nonpayment of taxes.2/

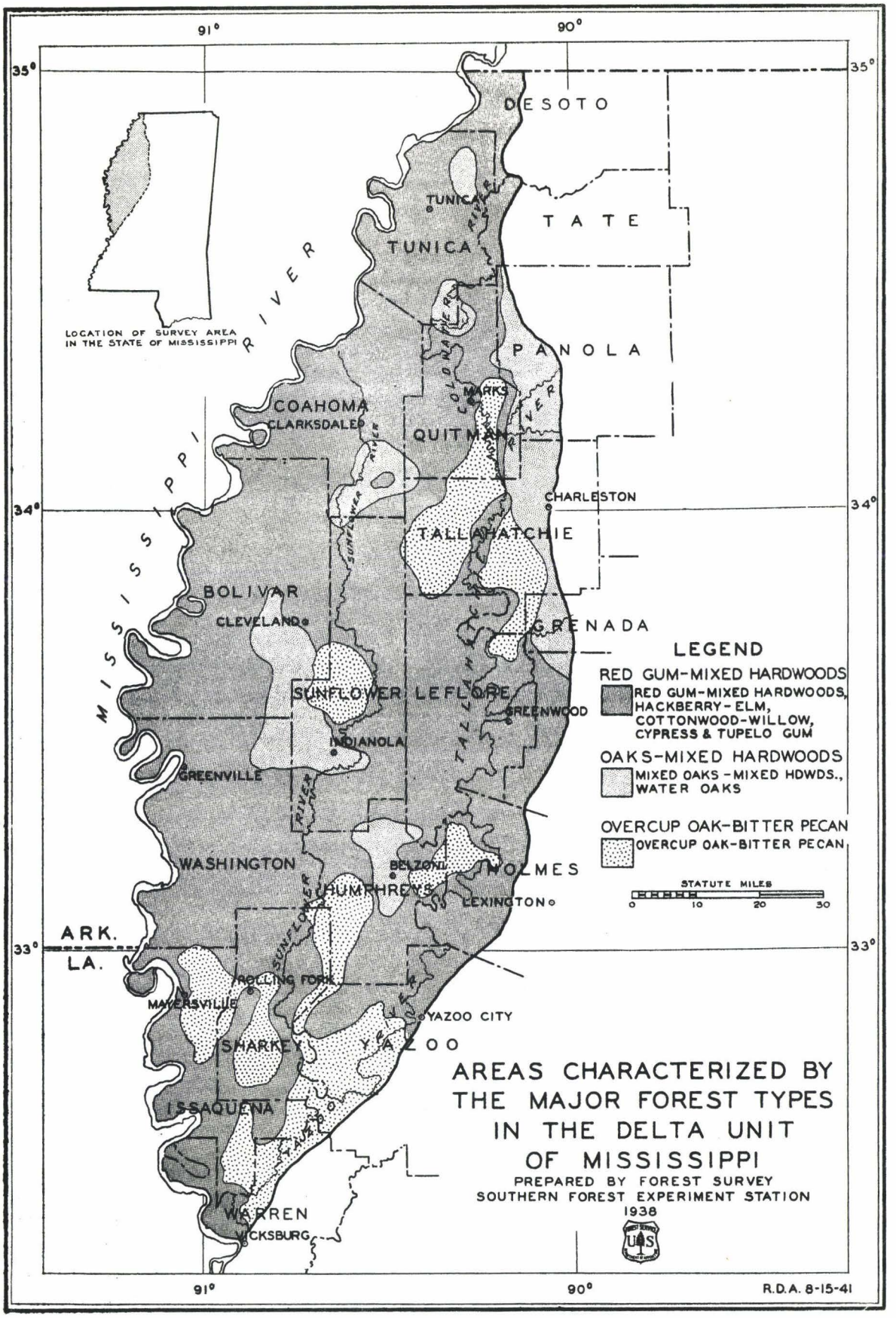
Forest Description

The present forest land in the Delta is confined chiefly to the backwater area above Vicksburg, to the Mississippi River batture, and to poorly drained interstream swales. Except for the backwater area in the southern part, few large unbroken areas of forest land remain. Approximately 80 percent of the forest acreage is held by owners of cotton plantations, more than two-thirds of it in holdings of less than 1,000 acres. Holdings of lumber companies and other timber operators make up most of the remainder and are important because they contain the principal concentrations of merchantable timber. A substantial percentage of the better-grade hardwood timber is located on the batture. In the farming areas, the forests are usually badly deteriorated.

The forests of the Delta unit are composed of a mixture of bottomland hardwood species (fig. 2), and in general have been cut over one or more times for sawlogs or other products. In table 2, the forest area is classified into seven forest types on a basis of species composition, and into five forest conditions on a basis of the character of the timber stands. Most prevalent is the overcup oak-bitter pecan type, occupying 26 percent of the forest area. It predominates on the poorly drained, waxy clay soils of backwater areas and also occurs commonly throughout the unit in shallow sloughs and basins. Second in order of area occupied, and most important commercially, is the redgum-mixed hardwoods type, which occurs on the better drained soils of low ridges throughout the Delta. The hackberry-elm type, in the old-growth partly-cut condition, is largely a residual stand left after the redgum-mixed hardwoods type has been logged. The cottonwood-willow type consists in reality of two separate, but closely related, forest types growing almost entirely on the batture, the two species seldom occurring together except in young stands. The cypress-tupelo type is primarily characteristic of swamps; in the better drained portions of the Delta it occurs as meandering "stringers," along the sloughs.

Old-growth timber stands at the time of this survey were found to occur on 30 percent of the forest area in the Delta. The area actually occupied by virgin old-growth timber was relatively small—less than 5 percent, the remainder having had many of its larger and more valuable trees removed. Of the area classed as old-growth timber, almost half was in the overcup oak-bitter pecan type, the principal species of which are in limited demand at the present time. Saw-timber size stands of second growth occurred on 43 percent of the forest area, while under-sawlog-size second-growth stands were found on most of the remaining 27 percent.

2/ A comprehensive study of the tax situation in the Mississippi Delta is contained in Occasional Paper No. 74, "Taxation of forest land in the Yazoo Delta of Mississippi," by Ronald B. Craig. July 23, 1938.


91°
90°
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DESOTO
TUNICA
TATE
PANOLA
COAHOMA
CLARKSDALE
QUITMAN
MARKS
CHARLESTON
TALLAHATCHIE
BOLIVAR
CLEVELAND
GRENADA
SUNFLOWER
LEFLORE
GREENWOOD
INDIANOLA
GREENVILLE
WASHINGTON
BELZONI
HOLMES
HUMPHREYS
LEXINGTON
ARK.
LA.
ROLLING FORK
MAYERSVILLE
YAZOO CITY
SHARKEY
YAZOO
ISSAQUENA
WARREN
VICKSBURG
MISSISSIPPI RIVER
LOCATION OF SURVEY AREA IN THE STATE OF MISSISSIPPI
LEGEND
RED GUM-MIXED HARDWOODS
RED GUM-MIXED HARDWOODS, HACKBERRY-ELM, COTTONWOOD-WILLOW, CYPRESS & TUPELO GUM
OAKS-MIXED HARDWOODS
MIXED OAKS-MIXED HDWDS., WATER OAKS
OVERCUP OAK-BITTER PECAN
OVERCUP OAK-BITTER PECAN
STATUTE MILES
0 10 20 30
AREAS CHARACTERIZED BY THE MAJOR FOREST TYPES IN THE DELTA UNIT OF MISSISSIPPI
PREPARED BY FOREST SURVEY
SOUTHERN FOREST EXPERIMENT STATION
1938
R.D.A. 8-15-41

Board-foot volume

The saw-timber component of the forest stand at the time of survey (1932) had a net volume (table 3) of 4.0 billion board feet by the Doyle log rule, 4.8 billion board feet Scribner, or 5.2 billion feet International ($\frac{1}{4}$-inch saw kerf). The Doyle rule is the legal log rule in Mississippi and is commonly used for measuring logs throughout the South, although it understates the board measure volume of small timber by a considerable margin. The International ($\frac{1}{4}$-inch saw kerf) rule most nearly approximates green lumber tally for all sizes of timber and is used later in this report for measuring tree growth, mortality, utilization drain, and changes in the forest growing stock.

Table 3.—Net volume in Doyle, Scribner, and International ($\frac{1}{4}$-inch kerf) log scales, classified according to species group, 1932

Species group	Doyle	Scribner	International
	Thousand board feet		
Redgum	463,800	516,700	569,000
Water oaks	526,500	592,700	647,100
Red oaks	34,700	41,900	46,500
White oaks	48,200	57,800	64,500
Low-grade white oaks	637,200	737,400	798,500
Ash	122,100	160,600	179,400
Cottonwood	260,400	296,500	318,400
Willow	152,400	195,000	217,000
Elms	312,500	382,800	425,700
Blackgum and tupelo	329,600	424,200	466,600
Cypress	320,100	371,900	409,400
Bitter pecan (water hickory)	354,200	409,300	449,600
Hickory	22,900	29,200	33,000
Sweet pecan	65,200	75,200	82,500
Hackberry	119,000	158,200	181,000
Miscellaneous	268,800	305,800	329,300
Total	4,037,600	4,755,200	5,217,500

The total net volume of 4.0 billion board feet, Doyle, was distributed 15 percent in the old-growth uncut condition, 38 percent in the old-growth partly-cut condition, and 47 percent in the remaining conditions (table 4a). In the order named, low-grade white oaks, wateroaks, and redgum occurred in greatest volume (table 4b). Sixty-five percent of the volume in saw timber was in higher-quality (class-A) stands. Of the volume in class-A stands, approximately 62 percent was in higher-quality logs; of the volume on class-B areas, 24 percent was in higher-quality logs. The fact that overcup oak and bitter pecan are hard to market is at least partially explained by the finding that 71 percent of the board-foot volume in low-grade white oaks and 53 percent of the bitter pecan was in lower-grade logs.

Table 4a.—Total net volume of good trees on forest areas, by forest conditions, 1932
(Board-foot volumes by Doyle log rule)

Forest conditions	Volume on class-A areas			Volume on class-B areas			Total volume	
	Saw timber		Under sawlog-size trees	Saw timber		Under sawlog-size trees	Saw timber	Under sawlog-size trees
	In higher-grade logs	In lower-grade logs		In higher-grade logs	In lower-grade logs			
	-- M board feet --		Cords	- M board feet -		Cords	M board feet	Cords
Old growth:								
Uncut	342,000	197,700	179,700	5,300	50,100	32,700	595,100	212,400
Partly cut	655,200	383,300	432,000	100,400	394,200	552,700	1,533,100	984,700
Second growth:								
Sawlog size:								
Uncut	554,500	358,300	722,900	156,400	396,100	1,683,100	1,465,300	2,406,000
Partly cut	80,200	62,700	140,200	59,300	181,300	592,100	383,500	732,300
Under sawlog size	-	-	-	14,500	41,600	1,154,800	56,100	1,154,800
Reproduction	-	-	-	1,100	3,300	7,100	4,400	7,100
Clear cut	-	-	-	negl.	100	1,300	100	1,300
Noncommodity	-	-	-	-	-	600	-	600
Total	1,631,900	1,002,000	1,474,800	337,000	1,066,700	4,024,400	4,037,600	5,499,200

Table 4b.—Total net volume of good trees on forest areas, by species groups, 1932
(Board-foot volumes by Doyle log rule)

Species group	Volume on class-A areas			Volume on class-B areas			Total volume	
	Saw timber		Under sawlog-size trees	Saw timber		Under sawlog-size trees	Saw timber	Under sawlog-size trees
	In higher-grade logs	In lower-grade logs		In higher-grade logs	In lower-grade logs			
	- M board feet - -		Cords	- M board feet - -		Cords	M board feet	Cords
Redgum	234,100	134,900	126,000	23,800	71,000	377,200	463,800	503,200
Water oaks	154,900	122,100	152,100	51,500	198,000	576,500	526,500	728,600
Red oaks	8,300	4,200	14,400	-	22,200	50,700	34,700	65,100
White oaks	13,100	6,800	27,600	7,200	21,100	56,200	48,200	83,800
Low-grade white oaks	164,200	210,400	85,400	18,800	243,800	287,200	637,200	372,600
Ash	52,900	27,700	102,900	25,200	16,300	246,800	122,100	349,700
Cottonwood	124,400	75,100	23,300	20,500	40,400	158,700	260,400	182,000
Willow	61,900	36,500	62,800	18,300	35,700	551,000	152,400	613,800
Elms	73,100	62,900	144,200	41,100	135,400	428,300	312,500	572,500
Blackgum and tupelo	193,300	84,700	167,100	32,100	19,500	154,600	329,600	321,700
Cypress	223,600	44,100	68,600	11,300	41,100	55,000	320,100	123,600
Bitter pecan (water hickory)	121,000	79,400	97,600	43,900	109,900	264,900	354,200	362,500
Hickory	3,200	6,500	13,300	4,200	9,000	82,800	22,900	96,100
Sweet pecan	34,800	11,400	20,100	3,500	15,500	95,400	65,200	115,500
Hackberry	20,300	41,600	181,200	14,900	42,200	272,200	119,000	453,400
Miscellaneous	148,800	53,700	188,200	20,700	45,600	366,900	268,800	555,100
Total	1,631,900	1,002,000	1,474,800	337,000	1,066,700	4,024,400	4,037,600	5,499,200

In table 5 is shown the average stand per acre on class-A and class-B areas in the different forest conditions. Class-A areas averaged 5,770 board feet Doyle per acre and class-B areas 1,090 board feet. The average stand per acre for the total forest area was 2,320 board feet Doyle.

Table 5.—Average volume in board feet per acre (Doyle log scale) on class-A and class-B areas, classified by forest conditions, 1932

Forest condition	Class-A areas	Class-B areas	Weighted average
	Board feet (Doyle)		
Old growth:			
Uncut	9,320	3,010	7,800
Partly cut:	5,670	1,900	3,450
Second growth:			
Sawlog size:			
Uncut	5,140	1,490	2,670
Partly cut	3,750	1,410	1,840
Under sawlog size, reproduction, clear-cut, and nonproductive areas	-	130	130
Weighted average, all conditions	5,770	1,090	2,320

Cordwood volume

The volume of sound material in various classes of trees and parts of trees, including saw timber, expressed in standard (4 x 4 x 8 feet) cords, was as follows:

Source	Cords
Under-sawlog-size trees	5,499,200
Sawlog-size trees:	
Sawlog material	12,869,900
Tops and limbs	6,946,900
Total	19,816,800
Cull trees	3,167,900
Grand total	28,483,900

The cordwood volume of under-sawlog-size trees includes the main stem of trees 5.0 inches d.b.h. or larger to a usable minimum top of 4 inches. The volume of saw-timber trees expressed in cords is separated into two categories, material in the sawlog portion and material above the sawlog portion, including limbwood over 4 inches in diameter. The volume in cull trees includes trees 5.0 inches and larger.

Cubic-foot volume

The volume of sound-tree growing stock (excluding cull trees, and the tops and limbs of saw-timber trees) was 1,251 million cubic feet, inside bark. The volume in saw-timber material was 906 million cubic feet, and the volume in under-sawlog-size trees, 345 million cubic feet.

Forest Increment

During the period 1932-1938 the volume of wood added annually in the forests of the Delta, through growth, averaged 255 million board feet per year for the saw-timber component of the growing stock, and 60 million cubic feet, or 860 thousand cords, for the total growing stock of trees 5.0 inches and larger (including saw timber). The average loss from mortality (but not cutting) was estimated at 49 million board feet per year for saw timber, and 15 million cubic feet, or 228 thousand cords, for all sizes (including saw timber). Average net growth or increment, therefore, was 206 million board feet per year for the saw-timber component, and 45 million cubic feet, or 632 thousand cords, for the total growing stock including both saw timber and smaller trees.

Included in the estimate of board-foot growth is: (1) the growth of trees already of sawlog size, and (2) the volume of trees becoming sawlog size. Included in the estimates of total cubic growth are (1) the growth of sound trees 5.0 inches d.b.h. and larger, and (2) the volume of small trees becoming 5.0 inches d.b.h. during the period. The mortality estimates include volume losses due to normal causes, such as crowding in dense stands, suppression, and maturity, and also losses due to destructive agencies, such as fire, wind, rot, and insects.

Table 6 shows the net volume of wood added to the inventory of sound trees during 1932, and its distribution by forest condition and tree diameter groups. The increase for the sawlog-size portion of the stand is expressed in board feet, lumber tally, and the increase for the under-sawlog-size portion in standard cords (4 x 4 x 8 feet). In arriving at these estimates, the movement of trees from one diameter group to another was taken into account. The net increment for all forest conditions, excluding the effect of current timber cutting operations, was 207.8 million board feet; 55 percent of this total occurred in trees 20 inches d.b.h. and larger, that is in trees that are of a size to return the greatest values.

Table 6.—Forest increment by tree size and forest condition, 1932

Forest condition	In trees under sawlog size	In sawlog-size trees		
		Diameter-group		Total
		14-18	20 and up	
	Cords	M board feet (green lumber tally)		
Old growth:				
Uncut	4,500	1,700	5,700	7,400
Partly cut	38,300	10,800	33,600	44,400
Second growth:				
Sawlog size	92,600	66,000	76,800	142,800
Under sawlog size 1/	86,500	15,900	-2,700	13,200
Total all conditions	221,900	94,400	113,400	207,800

1/ Includes reproduction and clear-cut.

The increment per acre in 1932 in the various forest conditions, in terms of board feet and cubic feet, excluding bark is given in table 7. In arriving at these estimates, deductions for natural mortality have been made, but no deductions have been made for material removed in timber-cutting operations or for the effect of this cutting on the year's increment. Cubic-foot increment includes material in the sawlog portion only of sawlog-size trees, and the full stem in trees under sawlog size. No limbwood is included in either.

Table 7.—Average increment per acre by forest conditions, 1932

Forest type group and condition	Annual increment	
	Board feet (green lumber tally 1/)	Cubic feet (inside bark)
Mixed hardwoods:		
Old growth:		
Uncut	128	21.8
Partly cut	114	23.8
Second growth:		
Sawlog size:		
Uncut	221	39.5
Partly cut	146	30.7
Under sawlog size	38	19.2
Overcut oak-bitter pecan:		
Old growth:		
Uncut	70	12.9
Partly cut	84	16.7
Second growth:		
Sawlog size:		
Uncut	120	28.4
Partly cut	65	16.2
Under sawlog size	24	11.5
All conditions 2/	119	25.7

1/ Based on International $\frac{1}{4}$-inch rule.
2/ Reproduction and clear-cut conditions included.

The average increment per acre for the entire forest was 119 board feet or 25.7 cubic feet in 1932. On the 475,800 acres of second-growth sawlog-size uncut area in the mixed hardwoods type group, the increment per acre averaged 221 board feet, or 39.5 cubic feet. The lower increment in overcup oak-bitter pecan stands is due chiefly to the slower growth rate of these species.

Forest Products Industries

In 1938 there were in the Mississippi Delta 175 forest-industrial plants, of which 165 were sawmills (fig. 3). In addition, 17 sawmills and 9 nonlumber forest-industrial plants located outside of the unit at Helena, Memphis, Arkansas City, and Vicksburg drew a substantial volume of logs from the forests of this unit.

The lumber industry

The medium-sized and large sawmills (20,000 board feet or more daily capacity) in this unit, of which there were 14 in 1938 (table 8), are the remnants of the industrial set up which during the past four decades cut the virgin hardwood timber for the nation's industrial hardwood lumber market. These mills are still cutting some virgin timber, but for the most part they are relying on second and third cuttings from the same forest land. In the main they are of the single band type, are operated by steam power, and are equipped to produce standard grades of well-manufactured lumber, which is usually air dried. Owing to exhaustion of nearby timber supplies of a quality to meet their requirements, several of these mills probably will be abandoned or moved within the next few years. Others, especially those near the Mississippi River where water transportation lengthens the logging reach, and where fast-growing, low-cost batture timber is available, can be expected to continue longer, perhaps indefinitely. A census of the plants in 1940 indicated that there were then 12 mills of this size in the unit.

Table 8.—Production and employment data in the lumber industry, 1938 1/

Daily capacity	Mills	Produced by mills in the unit	Mill employment	Produced from forests of the unit	Woods employment
M bd.ft.	Number	M bd.ft.	Thousand man-days	M bd.ft.	Thousand man-days
Under 20	151	19,400	30	15,200	19
20 - 39	11	33,700	44	38,300	54
40 and over	3	21,500	39	27,700	36
Total	165	74,600	113	81,200	109

1/ Based on a 10-hour operating day and green lumber tally.

The small mills, of which there were about 151 in 1938 and about 146 in 1940, are for the most part owned and operated intermittently in connection with farming. A few, however, are owned by commercial operators producing lumber, timbers, or ties, for shipment to the open market. The farm mills usually have a capacity of 3,000 to 6,000 board feet per day and operate only 10 to 60 days during the year. The commercial small mills frequently have a somewhat larger capacity and operate a greater portion of the year.

In 1938 the sawlogs cut from the forests of the unit amounted to 81 million board feet. Comparison of this figure with the 75 million board feet manufactured at sawmills in the unit reveals that a considerable volume was exported from the unit for manufacture in other sections. The 14 sawmills with a daily capacity of 20,000 or more board feet accounted for 74 percent of the lumber production, whereas the 151 small mills accounted for only 26 percent (table 8). From 38 million board feet in 1932, the production of lumber by mills in the unit rose to 100 million board feet in 1936, then declined to 75 million in 1938. With a resumption of general industrial activity in 1939 and under the stimulus of defense activities in 1940, the cut in the latter year rose to approximately 25 percent above the 1938 level.

Nonlumber industries

Nonlumber primary wood-using plants in the Delta during 1938 included 1 pulp mill, 1 veneer plant, 5 establishments making cooperage stock, and 3 others—total 10. These plants, together with outside nonlumber plants drawing from this unit, and the production of railroad cross ties, poles, and piles accounted for 136,000 man-days of employment (table 9). There is little competition for timber between the lumber and nonlumber industries since the latter operate, in large part, either on very high-quality trees or logs smaller in size than required by the lumber industry, or on lower-quality material found in second-growth and partly cut old-growth stands. In 1940 the number of nonlumber wood-using plants was the same as in 1938.

Table 9.—Production and employment data[1/] in the nonlumber forest industries, 1938

Kind of plant or commodity	Plants in unit	Produced by plants in unit	Plant employment	Produced from forests in unit	Woods employment
	Number	M bd.ft.	Thousand man-days	M bd.ft.	Thousand man-days
Veneer	1	17,700	33	15,900	21
		Pieces		Pieces	
Hewed cross ties	-	-	-	104,000	12
Poles and piles	-	-	-	2,000	1
		Cords		Cords	
Cooperage material	5	8,500	15	11,300	10
Pulpwood	1	21,000	26	8,400	10
Miscellaneous	3	1,700	5	1,900	3
Total	10	-	79	-	57

1/ Cordwood volume is expressed in standard (4 x 4 x 8 feet) cords, including bark. Board-foot volumes are in terms of the International $\frac{1}{4}$-inch log rule. Man-days are based on a 10-hour day.

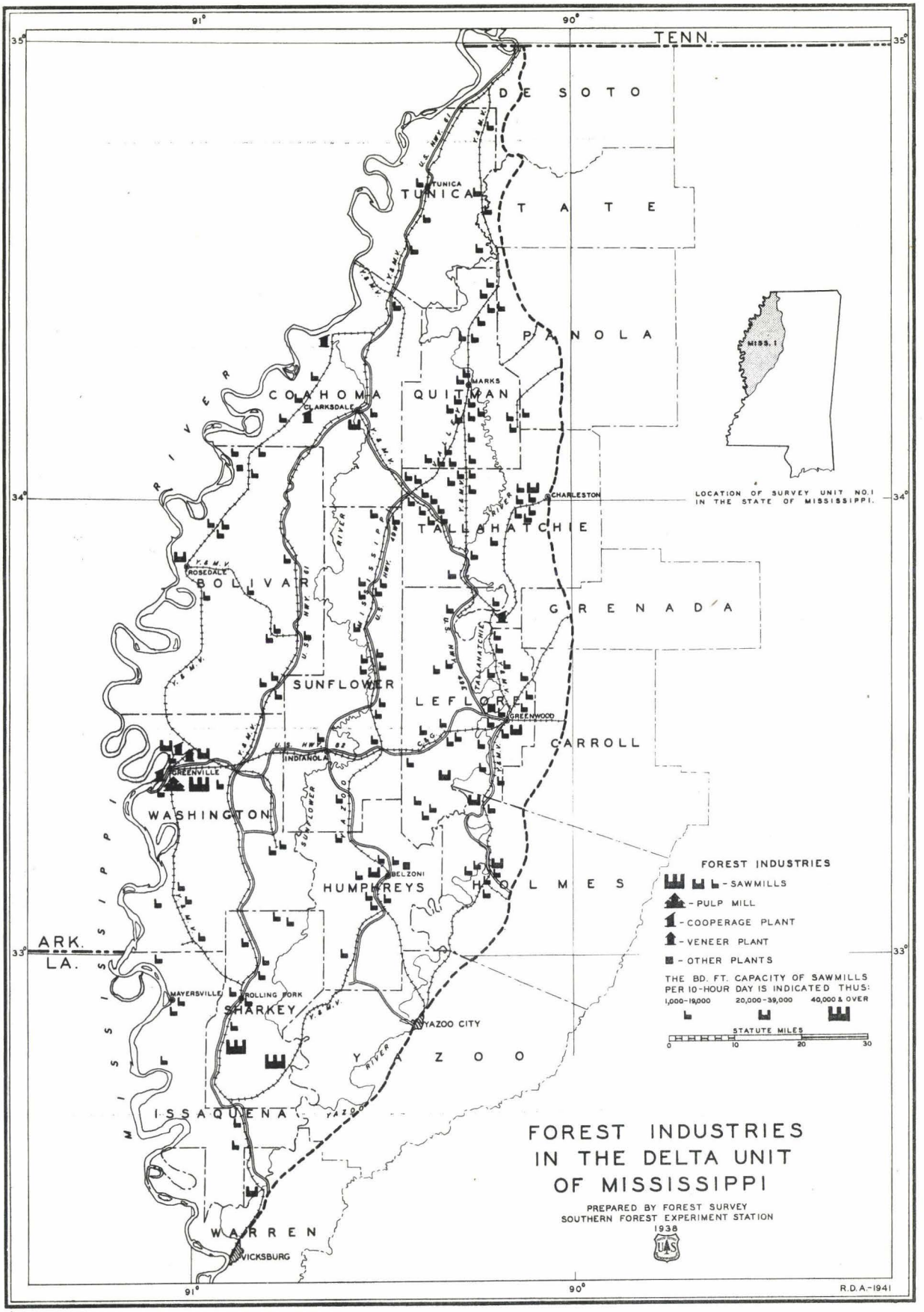
TENN.
DESOTO
TUNICA
TATE
PANOLA
COAHOMA
QUITMAN
TALLAHATCHIE
GRENADA
BOLIVAR
SUNFLOWER
LEFLORE
CARROLL
WASHINGTON
HUMPHREYS
HOLMES
SHARKEY
YAZOO
ISSAQUENA
WARREN
ARK.
LA.
MISSISSIPPI RIVER
YAZOO RIVER
CLARKSDALE
MARKS
CHARLESTON
ROSEDALE
INDIANOLA
GREENWOOD
GREENVILLE
BELZONI
MAYERSVILLE
ROLLING FORK
YAZOO CITY
VICKSBURG
MISS. 1
LOCATION OF SURVEY UNIT NO.1 IN THE STATE OF MISSISSIPPI.
FOREST INDUSTRIES
- SAWMILLS
- PULP MILL
- COOPERAGE PLANT
- VENEER PLANT
- OTHER PLANTS
THE BD. FT. CAPACITY OF SAWMILLS PER 10-HOUR DAY IS INDICATED THUS:
1,000-19,000
20,000-39,000
40,000 & OVER
STATUTE MILES
0
10
20
30
FOREST INDUSTRIES IN THE DELTA UNIT OF MISSISSIPPI
PREPARED BY FOREST SURVEY
SOUTHERN FOREST EXPERIMENT STATION
1938
R.D.A.-1941

FIGURE 3

Employment

With the data available, it is not possible to translate confidently the total employment of 358,000 man-days into the number of persons receiving either full- or part-time employment in the forest industries. Taking into account the intermittent character of the employment in many of the various activities it is probable that at least 3,500 people look to mill or forest work for all or part of their employment. To this should be added the labor involved in cutting 654 thousand cords of fuel wood and 2¼ million fence posts from live, dead, and cull trees; this probably amounts to approximately 609,000 man-days. Only a small portion of this additional employment was for cash wages, but it represents an important employment item. The material thus produced, without cash outlay and usually without interference with normal gainful employment, is a substitute for material that would otherwise have to be purchased.

Utilization Drain

In table 10 is shown the volume of material removed from the sound-tree growing stock during 1938 for industrial and domestic purposes. This volume, termed utilization drain, includes material meeting Survey specifications (see footnote 4 p. 10) but left in the woods as cutting waste; it does not include material cut from cull trees, dead trees, limbwood, or tops of saw-timber trees, which are not considered part of the growing stock.

Table 10.—Net volume of timber drain from the growing stock, 1938

Commodity	From sawlog-size trees	From all trees 5.0 inches d.b.h. and larger
	M bd.ft. (lumber tally)	M cu.ft. (i.b.)
Lumber	91,400	13,840
Veneer	18,200	2,650
Tight-cooperage material	100	10
Slack-cooperage material	7,400	1,160
Poles and piles	400	70
Hewed cross ties	4,800	840
Handles	300	50
Pulpwood	300	540
Material used by miscellaneous industries	900	160
Material cut in clearing land	41,800	11,070
Material cut for fuel, farm fence posts, and other domestic uses	49,400	23,180
Total	215,000	53,570

The 1938 drain from the saw-timber component of the growing stock was 215 million board feet, and the drain against the growing stock trees, 5.0 inches d.b.h. and larger, was 54 million cubic feet, or 763 thousand cords. In 1937, the board-foot and cubic-foot drain against the growing stock was somewhat greater; 274 million board feet and 63 million cubic feet, respectively, while the 7-year average for 1932-38 was 223 million board feet and 52 million cubic feet. Of interest is the fact that fuel, farm use, and land clearing account for almost two-thirds of the total drain. A high proportion of the volume cut for lumber, veneer, and cooperage material is taken from class-A areas (see p. 10).

Comparison of Increment and Drain

Estimate of changes in the forest inventory for the Delta region during the years 1932-1938, as a result of gains from growth, losses from mortality, and removal for industrial and domestic use are shown in table 11. Both the volume of saw timber and the volume of the total growing stock (including saw timber) declined during the 7-year period. The reduction was relatively small, slightly over 2 percent in the case of saw timber; but as regards the important matters of timber size, timber quality, and maintenance of a desirable proportion of more valuable species, the situation was less favorable. More than half of the saw-timber drain was for the manufacture of lumber, veneer, and cooperage, and came largely from the stock of higher-quality timber of the more valuable species. Even for the other uses, the general practice is, and long has been, to select the better trees for cutting and to leave trees of low quality and less valuable species. Regardless of the reasons back of such practice, the result of it is reflected in a high proportion of low-grade grees and less valuable species in many of the present stands. Reversal of this trend will depend largely on the extent to which timber comes to be handled as a crop instead of as something that just grows.

From 1932 through 1937, the saw-timber draft on the growing stock has tended to increase. From a surplus of growth over drain of 23 million board feet in 1932, the situation has shifted to a deficit of growth of 68 million board feet in 1937 (fig. 4). A similar trend obtained in respect to total drain and increment in cubic feet (fig. 5). In 1938, owing to a sharp decline in commodity drain arising from lowered demand, this trend was reversed. Since then, however, and particularly in 1940, it is estimated that the deficit of saw-timber increment in relation to drain is higher than it was three years previously.

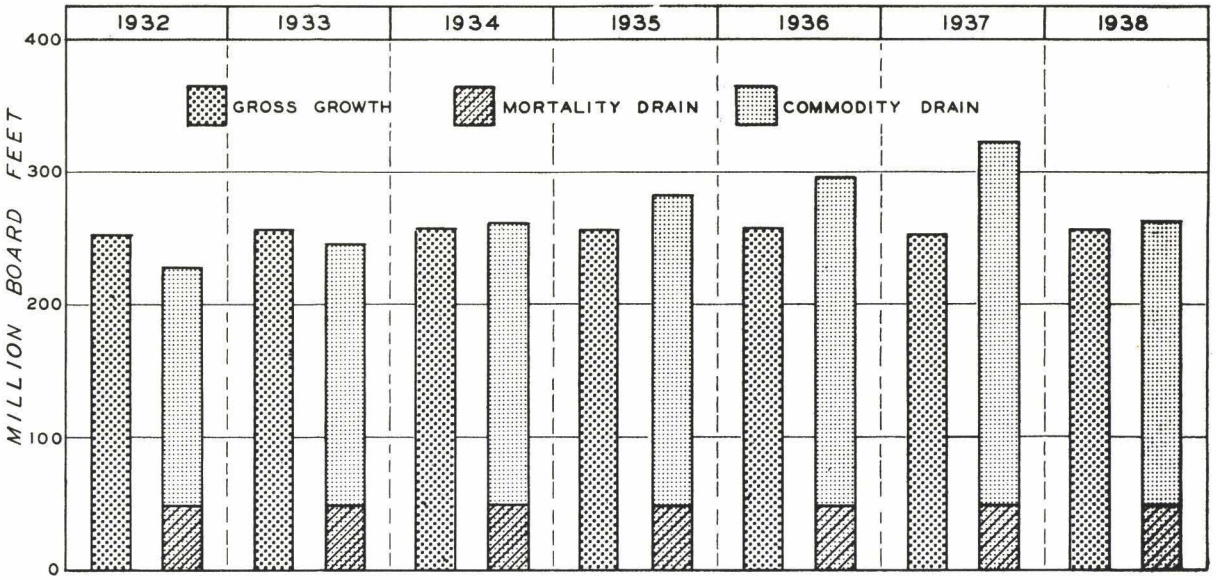

FIGURE 4.— COMPARISON OF GROSS GROWTH AND TOTAL DRAIN OF SAW-TIMBER MATERIAL.

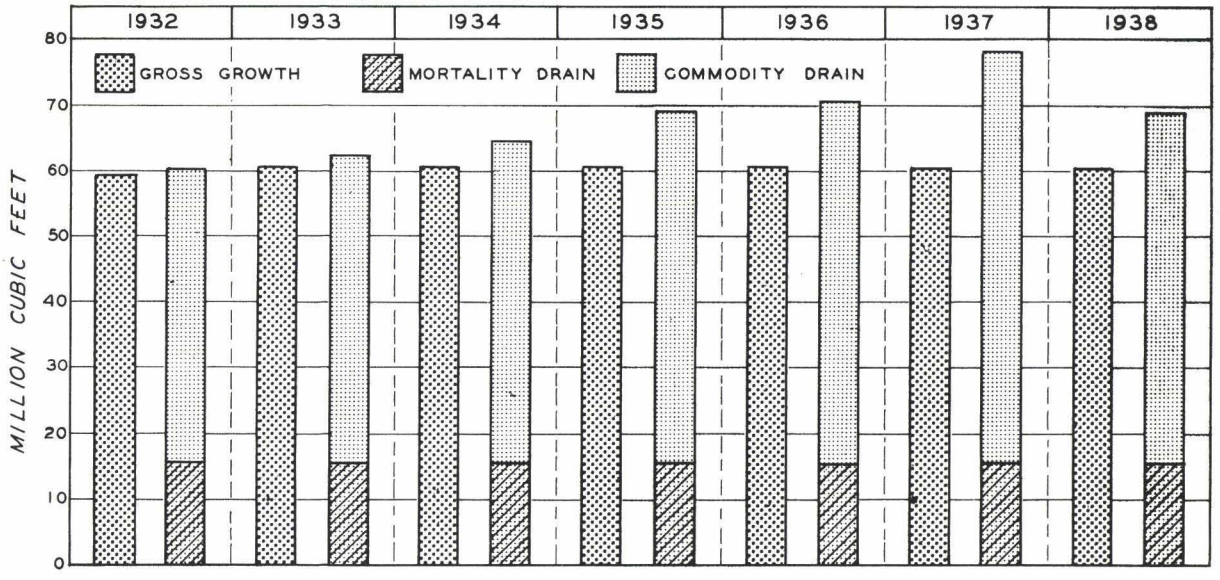

FIGURE 5.— COMPARISON OF GROSS GROWTH AND TOTAL DRAIN OF ENTIRE GROWING STOCK.

Table 11.—Increment, drain, and changes in the growing stock, 1932-1938

Item	1932	1933	1934	1935	1936	1937	1938
			Million board feet (lumber tally)				
Growing stock, Jan. 1	5,217.5	5,240.9	5,251.0	5,246.9	5,219.0	5,178.5	5,110.1
Growth	251.8	255.2	256.2	256.0	255.6	254.8	255.4
Mortality	48.8	48.9	49.0	48.8	48.8	49.2	49.2
Net increment	203.0	206.3	207.2	207.2	206.8	205.6	206.2
Commodity drain	179.6	196.2	211.3	235.1	247.3	274.0	215.0
Net change in growing stock	+23.4	+10.1	-4.1	-27.9	-40.5	-68.4	-8.8
Growing stock, Dec. 31	5,240.9	5,251.0	5,246.9	5,219.0	5,178.5	5,110.1	5,101.3
			Million cubic feet (inside bark)				
Growing stock, Jan. 1	1,250.6	1,249.8	1,248.0	1,244.2	1,235.8	1,225.7	1,207.7
Growth	59.4	60.6	60.8	60.7	60.6	60.4	60.2
Mortality	15.7	15.7	15.7	15.7	15.4	15.5	15.4
Net increment	43.7	44.9	45.1	45.0	45.2	44.9	44.8
Commodity drain	44.5	46.7	48.9	53.4	55.3	62.9	53.6
Net change in growing stock	-0.8	-1.8	-3.8	-8.4	-10.1	-18.0	-8.8
Growing stock, Dec. 31	1,249.8	1,248.0	1,244.2	1,235.8	1,225.7	1,207.7	1,198.9

Outlook for the Future

With its extensive reaches of deep, rich alluvial soil, the Delta portion of Mississippi has long been and no doubt will continue to be one of the outstanding agricultural sections of the South. At the time of this survey, more than 57 percent of its land area was in agricultural use. Nevertheless, after more than a century of agricultural development nearly 40 percent of the land area is still in forest cover. There is no reason to believe that the proportion of forests has reached its permanent level; on the contrary because of the many factors favorable to agriculture, it is to be expected that the use of land for tilled and forage crops will gradually extend even further into much of the area now occupied by forest growth.

The movement of cotton growers from the relatively less productive nearby upland regions into the more favorable soils of the Delta seems destined to continue until all of the land needed and suitable for agriculture has been put under the plow. The forests will be driven back until they occupy those areas where periodic floods, poor drainage conditions or unsuitable soils will give them a permanent tenure. In addition to these refractory sites, a large number of small tracts of farm woodlands will be maintained throughout the area in connection with individual farms and plantations to meet domestic needs for fuel, fence posts, and construction material and for woodland pasture. Without a good soil classification map it is difficult, if not impossible, to form an accurate estimate as to the minimum area on which forests may eventually stand in the unit. It is conceivable that in time the proportion of forest land may be reduced to as little as 30 percent. Whether or not the wooded area of the Delta unit is reduced to the extent here indicated, the forest resource must inevitably continue to play, as it always has, an important, if not essential, role in the economy of the section.

Private forest land management falls into two clearly differentiated classes. On the one hand are the farm forests, areas of comparatively small size owned and operated by farmers for the production of essential commodities needed in the farm economy and as sources of supplementary cash income and outlets for surplus between crop labor. On the other, are the more extensive forest areas operated as business enterprises in themselves, either independently or in conjunction with established wood-using manufacturing plants. These forests are located partly in the batture—that long unprotected strip of land lying between the river and the levee and extending from the Tennessee line southward to Vicksburg—and partly in the extensive "backwater" sections at the South end of the unit between the Mississippi and the Yazoo Rivers where lack of levee protection subjects the low-lying terrain to periodic inundation. In addition to these two main industrial forest areas, there are smaller nonfarmer-owned wooded areas scattered throughout the unit occupying terrain characterized by comparatively poor soils or with difficult drainage problems.

In neither farm nor industrial forest areas are there any natural factors that would tend to prohibit or even materially limit the successful growing of one crop after another of native hardwood species in well-stocked stands. The obstacles in the way of the development of the timber resource are almost entirely man-made and are by no means insuperable. Among the outstanding difficulties are, first, a lack of knowledge of the art of forestry, that is, what to do and how to do it, to turn the present badly deteriorated low-yielding second-growth stands into the high-grade

forests the sites are capable of supporting; second, inadequate market outlets for low-grade forest material. Before the growing and harvesting of timber crops can be undertaken as a business enterprise, there must be a marked broadening of the markets for the comparatively low-grade hardwood product that both now and for some time to come must make up a large part of the annual yield while the characteristically young second-growth stands are being brought to maturity. The long-established well-organized industrial hardwood lumber industry has always supplied the main outlet for the stumpage of the Delta. It was, and in the main still is, based upon the utilization of large, fully matured high-quality trees that characterized the original forest. The supply of such trees has been greatly reduced, and the industry can, and will, adapt itself to some extent at least to the radical change in the character of the forest, it will not be able to consume the great mass of comparatively low-quality material at hand and to be expected. The same thing may be said of the cooperage and veneer industries. A new market must be found for a great part of the intrinsically sound but industrially low-grade material. Large-scale expansion of the use of this wood for chemical conversion, particularly for paper and fibre board would go a long way in establishing a sound economic incentive for intensive forest management.

A third major obstacle is that interposed by an unfavorable tax situation. Even when the two obstacles first described have been overcome, forest management on any long-time basis would be a hazardous, if not an entirely uneconomic venture, if the present inequitable taxation situation were to continue to exist. Except for the batture strip and in some part of the backwater sections, where, in most cases, a drainage tax is not added to the regular State and county taxes, many forest areas are so burdened with high taxes as to make their continued use for forestry an uninviting prospect.

To surmount these main obstacles and encourage the development of good forest management it would seem that a well-planned attack, in which both public and private agencies must have a hand, must be simultaneously made along the whole front. The Federal Forest Service, the Soil Conservation Service, and the Mississippi Forest and Agricultural Extension Services should cooperatively undertake to educate forest-land owners, both farmers and industrialists, how to handle their forest stands to get best results. The same groups through other agricultural agencies, the public schools, the press and the radio should intensify their efforts to educate the general public also—state and county officials, bankers, users of forest products, chambers of commerce, the man on the street and at the cross roads, and, not least, the coming generation of citizens—as to the important role that a fully developed forest resource can play in their communities.

To be effective, this educational effort must be a sustained one, continued from year to year, intensified and varied to take advantage of established gains and increased interest. It should be bolstered and supplemented by the maintenance of publicly owned and operated demonstration forests, both large and small, where people may see for themselves how various forest situations should be handled and what results, both in trees and in money, can be attained. The State should maintain a number of conveniently located but not necessarily extensive demonstration forests, primarily for the education of the nonindustrial and farm woodland owner. The experimental and demonstration forest now established near Stoneville, in which silvicultural and management problems common to the Delta are being

studied by the Southern Forest Experiment Station of the U. S. Forest Service in cooperation with the Mississippi State Agricultural Experiment Station, should be continued with intensified activity.

For the purpose of demonstrating good forestry practices for the benefit of the industrial forest-land owners, a large scale intensively managed national forest is very desirable. Such a national forest is now in process of acquisition in the backwater section of the Delta unit. The lands within the authorized purchase area should be acquired by the Government as rapidly as possible and a fully organized and intensively operated national forest established.

There is a marked trend in recent years towards the use of some of the more common hardwoods in the manufacture of pulp for paper, containers, and building board, but so far progress in this direction has been slow and limited in extent. The conversion of hardwoods by distillation into industrial chemicals has been worked out, and there are several such plants in operation in other parts of the country. It has been stated that the field for expansion here was somewhat limited, but progress in the field of chemistry is so great and so unpredictable that it is within the realm of possibility that the presence of huge supplies of cheap raw material, such as is found in this and other sections of the bottomland hardwoods of the Mississippi flood plains, coupled with possible post-war changes in world trade may bring development of industries of this nature in this unit. The same thing might be said concerning industries based upon the manufacture of plastics.

The Forest Products Laboratory of the Forest Service at Madison, Wisconsin, is very much alive to the great need for developing new uses and extending established ones for low-grade hardwoods and are actively at work along these lines. This research should be intensified and continuously maintained.

The tax problem as it concerns forest land in this unit is one that the local people and the citizens of the State generally must solve for themselves. It is a complicated one with deep-seated difficulties. The State government has already shown consciousness of the need and has made commendable preliminary progress towards its solution. Achievement in developing an equitable and adequate tax system will, in large measure, be paced by the educational program in forestry; successful tax reform cannot be expected until the people of the State are sufficiently forestry minded to define and demand it.

This Delta unit of Mississippi was once the home of one of the finest and most valuable hardwood forests in the nation. The natural factors that produced it are still there. Even after all of the best tillable land has been dedicated to agricultural crops, there will remain a sufficient area of strong forest soil upon which another forest of hardwood, even more valuable than the original one can be grown. The first crop, now almost gone, matured through the centuries without either the interference or the aid of man. The next crop, now on its way, can be grown to a successful and valuable maturity only through sustained protection and conscious management by man. The nucleus of a new forest is at hand. Nature's efforts to repeat the cycle can be stultified through ignorance and abuse or they can be speeded up and greatly aided through wise husbandry.

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